An intentional class design model to engage first year students with threshold concepts using the academic discourse theories of Vygotsky and Laurillard

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Abstract

In the context of the first-year university classroom, this paper develops Vygotsky's claim that 'the relations between the higher mental functions were at one time real relations between people'. By taking the main horizontal and hierarchical levels of classroom discourse and dialogue (student-student, student-teacher, teacher-teacher) and marrying these with the possibilities opened up by Laurillard's conversational framework, we argue that the learning challenge of a 'troublesome' threshold concept might be met by a carefully designed sequence of teaching events and experiences for first year students, and we provide a number of strategies that exploit each level of these 'hierarchies of discourse'. We suggest that an analytical approach to classroom design that embodies these levels of discourse in sequenced dialogic methods could be used by teachers as a strategy to interrogate and adjust teaching-in-practice especially in the first year of university study.

Introduction

In 'Genesis of the higher mental functions', Vygotsky writes:

> There is an indubitable genetic connection between the child's arguments and his reflections. This is confirmed by the child's logic itself. The proofs first arise in the arguments between children and are then transferred within the child. … The child's logic develops only with the increasing socialization of the child's speech and all of the child's experience … Piaget has found that precisely the sudden transition from preschool age to school age leads to a change in the forms of collective activity and that on this basis the child's thinking also changes. 'Reflection' says this author 'may be regarded as inner argumentation…' If we consider this law, we will see very clearly why all that is internal in the higher mental functions was at one time external…*In general we may say that the relations between the higher mental functions were at one time real relations between people…*We might therefore designate the main result to which we are brought by the history of the child's cultural development as a sociogenesis of the higher forms of behaviour (our italics) (Vygotsky, 1991).

Few statements in educational literature capture so succinctly and simultaneously the nature of academic discourse, the idea of learning as a transformative process and the intellectual tasks of knowledge assimilation that face the novice learner. Vygotsky's words remind us that our task as teachers is to take that which is 'out there' (the academic discourse of our discipline) and successfully move it 'in here' (into the student's heart and mind, as internalised, useable knowledge and understanding). But his words are also a prompt: can we use what is 'out there', that is, the 'real relations between people' in the classroom, to initiate

and develop our students' learning in scaffolded ways, and successfully lead them from novice/introductory, through development, to learning mastery? (A progression that the Australian Qualifications Framework now requires to see exemplified.)

In this paper we argue that the task set by Vygotsky's words – that of using the external 'real relations' of the classroom to feed and shape the student's internal reflection and argumentation (the 'higher mental functions') can be put into practice using Laurillard's 'conversational framework'. By situating the key hierarchical and horizontal levels of classroom discourse (student-student, student-teacher, teacher-teacher) in Laurillard's framework, the teacher can plan sequences of learning events and experiences that allow students to enact and gradually internalise the discourse of the discipline (that is, its concepts, ways of arguing, and so on). To illustrate this approach we use examples from the teaching of threshold concepts. These are acknowledged as a crucial element in student understanding in every discipline, but teachers puzzle over the most effective strategies to help their students reach understanding and mastery. We believe a combined Vygotsky-Laurillard approach can help determine and evaluate appropriate teaching strategies. Further, as an analytical tool, the approach can help in the evaluation of teaching-in-practice, and give practitioners a 'hook' for constructive professional reflective practice.

Threshold concepts and their importance in the first year

Threshold concepts are foundational precepts in a discipline; and they are transformative and integrative in nature. Ackerland et al say that: 'once understood, they transform students' views of the subject area, because they enable students to coherently integrate what were previously seen as unrelated aspects of the subject, providing a new way of thinking about it.' (2010, p. 2). Meyer and Land state that it is impossible for a novice learner to successfully proceed in their chosen discipline if s/he has not understood and internalised the threshold concepts of that discipline (Meyer & Land, 2006). Threshold concepts are often 'troublesome': counter-intuitive, disruptive of previously settled understanding, and not only intellectually but emotionally (and perhaps epistemologically) challenging for new learners. Additionally, threshold concepts are irreversible (once grasped there is no going back, because a student's understanding has gone through a qualitative 'step' change, sometimes called a 'portal' in the literature); they are integrative, connecting with other knowledge in the discipline, and they are bounded, having parameters beyond which they do not apply (Meyer & Land, 2006).

Perkins (2006) highlights the difficulties students face with the element of 'integration'. After grasping the concept in a self-standing manner, the student has to fit it into her/his existing mental schema: this may involve re-framing previously learned knowledge into new and different patterns, and/or synthesising the concept with existing ideas. Teachers are familiar with the situation where students can articulate and even practise new learning, but cannot afterwards integrate it into the wider context of their overall knowledge. For students, this is part of the challenge of constructing their own mental model of the discipline they are studying; as Davies comments: 'When an individual acquires a threshold concept the ideas and procedures of the subject make sense to them when before they seemed alien' (2006, p. 74), and threshold concepts have in consequence been called the 'jewels in the curriculum' (Land, Cousins, Meyer & Davies, 2005, p. 5). Akerland et al confirm that 'a focus on threshold concepts helps play a diagnostic role in curriculum design, highlighting for teachers areas of the curriculum that deserve special attention, not only because they represent transformative learning points, but because this is where students are most likely to

experience difficulties in their learning' (2010, p. 2). So, how might the 'real relations' of the classroom, and academic discourse, assist first year educators in teaching threshold concepts in their disciplines?

A Vygotskian modelling strategy and Laurillard's conversational framework

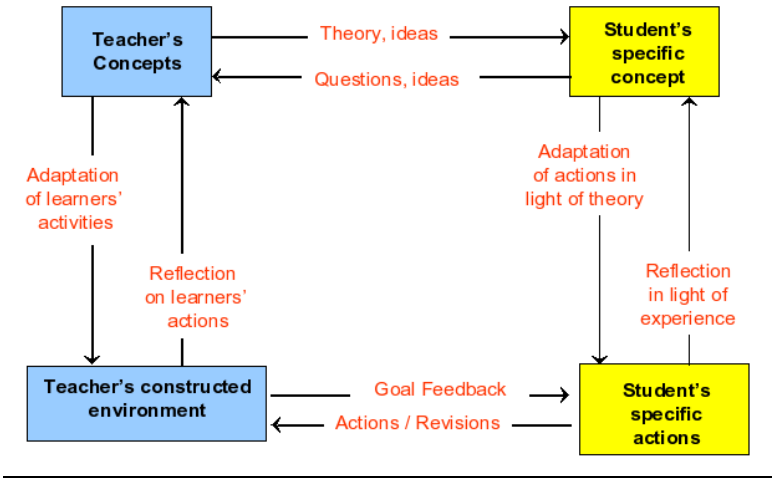
The first element of our strategy is derived from Vygotsky's paragraph (quoted above). Though his topic is the formation of thinking in young children, his words are strikingly relevant to the situation facing first year students making the transition from pre-university to university study. For, just as the child's move from pre-school to school brings her/him into new relations and connections (with teachers, institutions, school children peers, and subjects to be learned), so the student entering university for the first time is similarly positioned in new and unfamiliar ways (the world of academia, curricula, disciplines, the demands of higher-order thinking, undertaking research). The first year student is faced with the challenge of understanding and internalising, (through 'reflection and argumentation,' as Vygotsky puts it), the content and 'rules of the game' of the chosen discipline, and 'threshold concepts' are paradigm cases of this challenge. All this is done through language – the external 'real relations' are expressed to the student through language, and the student's internal reflection and argumentation are processes of speaking to oneself that are constructed, and gradually modified, until personal language is 'shaped' into the language of the discipline. Academic discourse is thus at the heart of everything we do as teachers, which is why Laurillard's 'conversational framework' (2002) is such a powerful tool (the idea of learning as conversation being first formalised by Pask (1976) as Conversation Theory). Laurillard's framework provides a clear structure and theoretical foundation for using academic discourse to enhance student engagement with threshold concepts. It calls for 'iterative dialogue', and learning through conversation that is 'discursive, adaptive, interactive and reflective' (2002, pp. 86-89).

This conversational framework 'situates learning as a relationship between the learner and the world, mediated by the teacher' (Laurillard, 2002, p. 86), making dialogue primary in the 'real relations' of the classroom. In the first year classroom, where novice learners are brought together with (expert) teachers, these relations are most clearly seen as a series of hierarchies, with wide cognitive and intellectual distances between the main groupings – learners/other learners, learners/teachers, and (in co-teaching) teachers/teachers. If these horizontal and vertical lines of academic discourse are used as demarcations, academic discourse can be crafted into activities that scaffold student learning, from the initial integration of familiar into unfamiliar thought-experiments, through to 'action-in-the-world' experiences (Laurillard, 2002, p. 88). Sensitive use of the conversational framework means learning can be neither pressured nor intimidating (Hativa, 2000), but instead connected and supportive, making the learning of a 'troublesome' threshold concept a positive learning experience for first-year students, building their confidence at this crucial initial stage. Conversational experiences, intentionally designed to engage students with threshold concepts, will involve dialogic interaction at the various levels of real relations, and can include: students talking with each other, students talking with lecturers, professional conversation and expert debate modelled for students through a co-teaching approach, and students developing internal conversations in the classroom (and outside of it) in their own reflections.

The key player in all this is the teacher. Laurillard suggests that s/he 'mediates' the students' learning experiences, but we would claim that s/he also 'composes' and 'orchestrates'. For it

is the teacher who decides what language is appropriate for each relational interaction and how it should be embodied in meaningful activity; it is the teacher who decides when to move between learner-learner and teacher-learner activities, or when an element of learning needs further iteration. The initial 'score' is composed by the teacher, who then orchestrates the learning experiences, which is why this approach is 'intentional'; nothing happens haphazardly. There is, as there must be, participation by the students at all times, because the teacher's goal is to develop the students' thought formation through their capacity to articulate their thinking; but the framing, goal-setting and ascertaining of progress is orchestrated by the teacher.

The following diagram represents the conversational framework: (http://edutechwiki.unige.ch/en/Laurillard_conversational_framework)



In the next sections we show how these classroom relations and interactions, and the enactment of the theories of Vygotsky and Laurillard, can provide effective opportunities for students to understand threshold concepts in their discipline.

The first stage of threshold concept learning: learner-learner relations

Teachers, being experts in their discipline, live in a different linguistic and conceptual world from their learners. Indeed, the 'irreversibility' of threshold concepts means it is almost impossible for teachers to 'reverse' their language to the 'primitive' language and world-view of the novice. For this reason the learner-learner relation is a crucial start-point for student learning, especially in first year classes where learners are at the elementary, novice stage. Because learners who inhabit the same conceptual and linguistic world tend to share the same difficulties in understanding, they can be best placed to mutually solve them, using their existing familiar conceptual and language structures as 'bridges' to help them move towards new, unfamiliar ideas (this is Vygotsky's well-known 'zone of proximal development').

One way to do this is to introduce linguistic 'bridges' to the new ideas, through analogies, metaphors and/or everyday examples. For example, in teaching a fundamental Biology Unit to first-year students Dr Elisa Bone (2010) used the idea of the fraying ends of shoelaces as 'analogous to chromosome telemeres and telomerase as the equivalent of repairing the little plastic end on the lace'. Because this analogy was familiar to the students it could be depended on to be effective. In contrast, Land et al (2005) cite an example where a concept was simplified and an *apparently* 'everyday example' was used in an accountancy course.

This was unsuccessful because the students had not personally had the budgetary or financial experience that would have made the example familiar to them. Using the language of this paper, the 'real relations' of the classroom were not properly gauged and the use of an example outside the cognitive and linguistic scope of the students meant that the strategy did not work.

Although finding and using accurate examples is an effective start, it is unlikely that one set of introductory linguistic 'bridges' will sufficiently elucidate the concept for all learners, because each learner has her/his own unique configuration of language and understanding (their 'idiolect'). Students should therefore be encouraged to find for themselves workable 'bridges' (metaphors/analogies/examples) in student group and class activities. Then, in teacher-student discussion, these suggested 'bridges' can be tested and their validity for the threshold concept teased out – how far will the suggested analogy hold? How accurate is the metaphor? These activities give students valuable footholds in their understanding, and as variation theory has established (Marton & Tsui, 2004) if a learner can make an initial connection with the concept, a link has been created that can be refined and corrected through further learning activities. Simplification strategies can also be used to break the concept down into small parts, building up only gradually to the whole picture, and being always prepared to return to basic steps to consolidate understanding. An example from Peter Davies's (2006) work on threshold concepts reminds us that students' understanding can wax and wane on the way to understanding ('I got it and then I lost it and then I sort of got it again but now I'm completely, you know… .').

Such conversational strategies, between learners and learners, and teachers and learners, provide initial supportive engagement with threshold concepts and we do not believe they should be assessed. Collaborative conversations between learners permit mutual sense-making; introducing assessment would result in competition and make students more likely to withhold rather than share their ideas. These interactions are about experimentation, where mistakes are made and mutually corrected, and assessment would negate the important role of 'getting things wrong' on the journey to 'getting things right'. This is well shown in the work carried out by Todd at Bryn Mawr. She created a blend of speaking and writing activities to develop students' writing skills. Student feedback shows the power of these conversations: 'feedback reflected student preference for a wide variety of uniformly sustained interactive oral exchanges, in both small and large groups… In other words, the students were seeking opportunities to rehearse ideas and writing strategies by speaking with each other. ("We get ideas from each other." "We're working together to understand it." "When she made point x, I saw how I could change my claim.")'… 'End of semester oral feedback indicated that in addition to supporting critical thinking, reading and writing skills, the students felt more confident as a result of the support of their classmates. ("You know you can get help here." "Our class knows how to support each other."). Todd reports an increased level of student performance and competence, suggesting that the outcomes were successful.

These activities, where learners work together to collaboratively create understanding, show above all the important role of the teacher. She must correctly understand the 'real relations' of the classroom, choose appropriate linguistic structures and learning settings, and judge when it is time to intervene, either to correct or to take things to the next level. The Land (2005) example shows that not every activity will work, but an analytical tool that aligns level and nature of discourse to the real relations of the classroom will identify and hopefully minimise such occurrences. As Salmon reminds us, the learning facilitator's role is to 'make it good, make it real and make it worthwhile' (Salmon, 2000, p. 98).

The developmental stage of threshold concept learning – teacher-learner relations

As suggested above, once initial understanding is achieved, the teacher-learner relation is used to move the students' learning forward incrementally. This often involves the use of academic texts, and here the choice of texts is significant, for just as conversational classroom relations embody hierarchies of academic discourse, so too do academic texts. Every text (print, online, verbal, visual) embodies assumptions about the learner's knowledge and understanding, and needs to be mediated by the teacher: is this resource at the right level for the students? Will they need extra help to make sense of it? Increasingly, publishers are aware of the needs of novice learners, and are producing appropriate texts, eg Pearson's MyEconLab.

In terms of further classroom strategies, it is particularly appropriate to use the strategy of 'modelling'. Threshold concepts exemplify the workings of the discipline, and so the teacher can 'enact' them as 'model' sequences of thought and action. This can be accompanied by a commentary to explain why one option but not another is taken ('I do this, then I do this, then I could do this, but I don't, because…, then my next step is…', and so on). Sequences like this give students a pattern that they can imitate, and are thus another useful 'bridge', allowing students to 'borrow' the teacher's language to familiarise themselves with the concept's flow of thought, while at a deeper, more internal level of reflection and argumentation, they are creating their personally articulated understandings (Northedge, 2003). However, as the threshold concepts literature emphasises, it is important to move students into their own formulations of understanding in order to avoid surface 'mimicry'. As soon as possible therefore, students should be asked to articulate the sequences of thought and action for themselves (most usefully with the support and encouragement of their peers).

Visualisation and animation are powerful tools for developing students' understanding of threshold concepts, as was shown in the ALTC Biology project on Threshold Concepts (2009). They found that verisimilitude was crucial, and that 'using 2D images is not effective in helping students to learn', whereas 3D really brought home to them the relative sizes of molecules and structures and the speed of the processes (through animations) ...' Seeing the movement involved in making mRNA on a DNA molecule was also a revelation, particularly in terms of the length of the molecule and the speed of the process.'

Because threshold concepts require learners to connect existing knowledge in new ways, a visual map can be a helpful consolidation, as the links will graphically display the inter-relatedness of the concept and its guiding principles. McCulloch & Edwards (2005) suggest building the map through the sequence of lessons, and asking the students to record the growing complexity, eg by using contrasting colours to illustrate new information, thus illustrating the progressive layering of understanding. The initial map remains as a basic text that can be returned to in order to consolidate understanding, as the contrasting layers show the organic development of the idea. As work in the discipline progresses, students will increasingly have to use multiple, inter-related threshold concepts. Thus, when a new threshold concept is introduced, the earlier maps are built on to show how the new threshold concept links to or subsumes the previous one. In this way integration begins to be possible.

As we have emphasised, threshold concepts need to be 'deep learned', that is, internalised and accepted by learners. Tertiary educators have long known that active student learning is a key facilitator of deep learning (Gibbs, 1982; Hativa, 2000; Laurillard, 2002, p. 13 referring to the work of Vygotsky, Piaget, Bruner and Papert), and that student learning is enhanced when teaching activities are intentionally designed to be learner-centred. As we have seen, face-to-face classroom learning settings can richly exploit the potential of conversational learning, but there are other equally powerful possibilities. For example, in blended learning settings, learners can be asked to write collective notes and summaries in class (on a large screen and using a volunteer student as note taker). This has additional potential beyond the simple 'visual map' mentioned above, because it starts students off on the crucial move from speech to writing which is so important for academic success. The understandings that students can achieve in group discussions are all too often lost after the session is over. Moreover, group speech contains a great deal of redundancy, as well as understandings that are either tacit or not pushed through to a conclusion. The task of writing forces completion of the thought processes, which then have an ongoing existence – as a resource for revision, or a text for correction or elaboration as learning proceeds. This can be paralleled by asking students to read their notes in the classroom. The use of roving microphones to capture student contributions to the classroom conversation ensures all students have a chance to speak, be heard clearly and to interact (Field & Kent, 2006). This particular strategy, when also linked to an audio-stream recording of the lecture, can enhance the engagement (and reduce the isolation) of external or online students, and give them the security of a recording of the learning conversation to which they can return in their own time (Field & Kent, 2006).

In a recent article on threshold concept learning using experiential learning settings, Burch, Bradley, and Burch (2014) point out the central role of conversational learning. When the experiential learning is well-designed, students interact with others and are likely to hear multiple viewpoints. Through appropriately sequenced activities, students are able to articulate and test their experiences and create new understandings. Thus, through the combination of thinking, verbalising and action, students can determine why the new knowledge of a threshold concept is accurate and useful. This then importantly allows them to 'let go of' their old knowledge.

Transition from the pre-liminal through the liminal stages of threshold concept understanding needs to be gradual, incremental, recursive and iterative. Overall, the process of development should lead to progressively more advanced sequences of teacher-learner and learner-learner interactions until everyone is satisfied that the concept is understood at a basic, stand-alone level. This is a kind of 'mastery-with-a-small-m' in the learning spiral that culminates in full mastery of the threshold concept.

These strategies show how language, visual representation and carefuly-designed learning settings can encourage the active engagement of students in leaner-learner and teacher-learner relationships and make the classroom a place of collective and collaborative learning. Such an environment can only support the deep learning necessary for the understanding of threshold concepts.

The mastery stage of threshold concept learning – teacher (expert) – teacher (expert) relations

The final stages in the assimilation of a threshold concept are 'integration' and 'boundedness', which, once achieved by learners, exemplify true mastery of the concept. Integration of the concept in the 'real relations between people' is akin to witnessing and understanding the operation of the concept-in-practice, either through the workings of the discipline or through an example in professional practice; while boundedness would be demonstrated by recognising what lies outside the scope of the concept.

In both cases, we suggest a further development of the modelling strategy discussed in earlier sections. This time, two teachers/facilitators, acting as discipline experts, engage in an academic discussion illustrating real world professional perspectives on the threshold concept under study. This discussion is carefully crafted to show the concept-in-action as part of a larger discourse (for example, a case study, an experiment, a discussion of a text – depending on the discipline in question). This strategy is designed to engage students at a higher cognitive level of understanding the concept and it gauges their ability to see how the concept underpins and advances knowledge claims in the discipline.

The presence of the two facilitators, and the organic balance of personalities and interactions in the large group, is the key to success in this strategy. The facilitators must themselves be engaged in and committed to the process, to show the students that this is genuinely the 'natural' speech of the discipline-in-action. If this is done convincingly, students will be drawn in to the process and will engage with it, factors conducive to effective learning. Students observe this enactment, with a set task to explain why and how the concept has been used, what was achieved by its use, and what were the limits of its usefulness. Afterwards the students' understanding can be checked by replaying the sequence and unpicking the various strands. More advanced expert-expert examples can be introduced for a further stage, using more complex discussions that have not been scripted to be so easily deconstructed, using 'live' discussions by outside experts, or by having guest speakers talk to learners in ways that use the threshold concept in an integrated way.

Conclusion

In this paper we have combined the ideas of Vygotsky and Laurillard into a multi-layered scaffolding model for guiding classroom practice, illustrating our suggestions with examples taken from the literature on threshold concept theory. Although we have used threshold concepts as a paradigmatic case, we suggest that the model has wider application across the spectrum of first year teaching, and offers teachers a rich and useful tool for exploring the potential of the 'real relations' at this crucial time of students' initiation into their discipline. We have also argued that this multi-layered scaffolding model has significant value as a strategy to interrogate and adjust teaching-in-practice, especially in the first year of university study.

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